

Logic Families

- Improved TTL series :

* 74HXX (high speed TTL) :

- reduce the internal resistor.
- increase consumption.
- Propagation delay = $\frac{1}{2} t_p$ for fundamental.

* 74LXX (Low Power TTL) :

- increase Internal resistor
- Decrease consumption
- Schotky TTL : (74SXX)

ON $\rightarrow 0.3V$

Equivalent circuit \Rightarrow Schotky transistor



* 74LSXX (Low Power Schotky TTL)

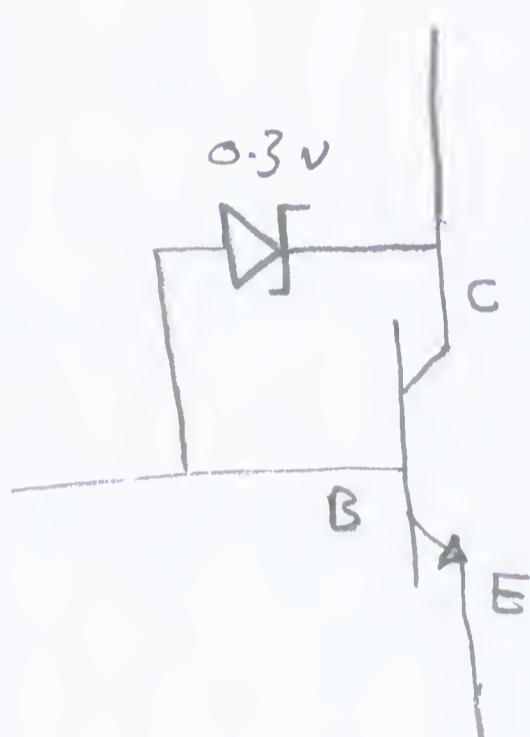


Schotky transistor

* 74ALSXX (Advanced Low Power Schotky TTL) :

propagation delay = 4ns

Power dissipation = 1 mW

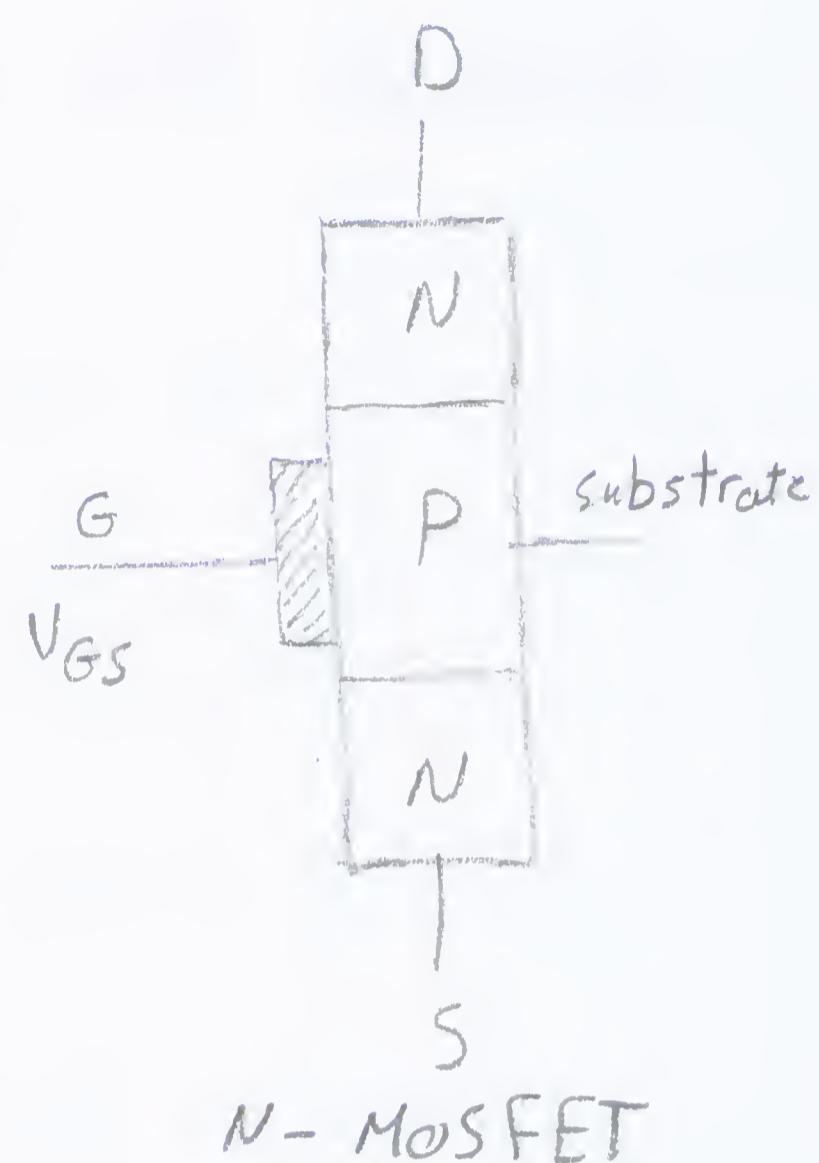


CMOS family : (Complementary Metal oxide semiconductor)

MOSFET {
 N- MOSFET
 P- MOSFET
 → LSI
 VLSI

{
 $V_{GS} > 0 \Rightarrow ON$
 $V_{GS} \leq 0 \Rightarrow off$ (N- MOSFET)

{
 $V_{GS} \leq 0 \Rightarrow ON$
 $V_{GS} > 0 \Rightarrow off$ (P- MOSFET)



CMOS : ($V_{DD} \rightarrow 3V : 15V$)

$V_{in} \rightarrow$ Logic 1

N- MOSFET $\rightarrow ON$

P- " " $\rightarrow off$

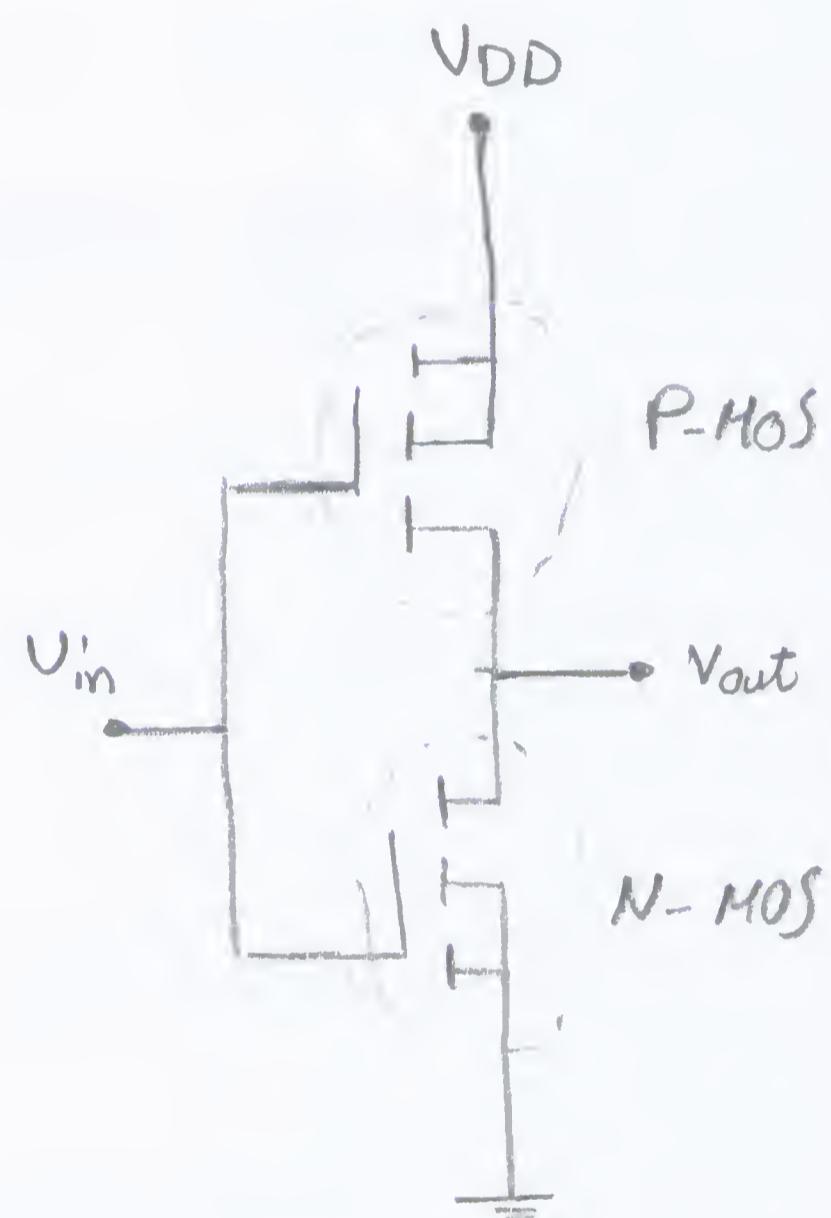
$V_{out} \rightarrow$ Logic 0

$V_{in} \rightarrow$ Logic 0

P- MOSFET $\rightarrow ON$

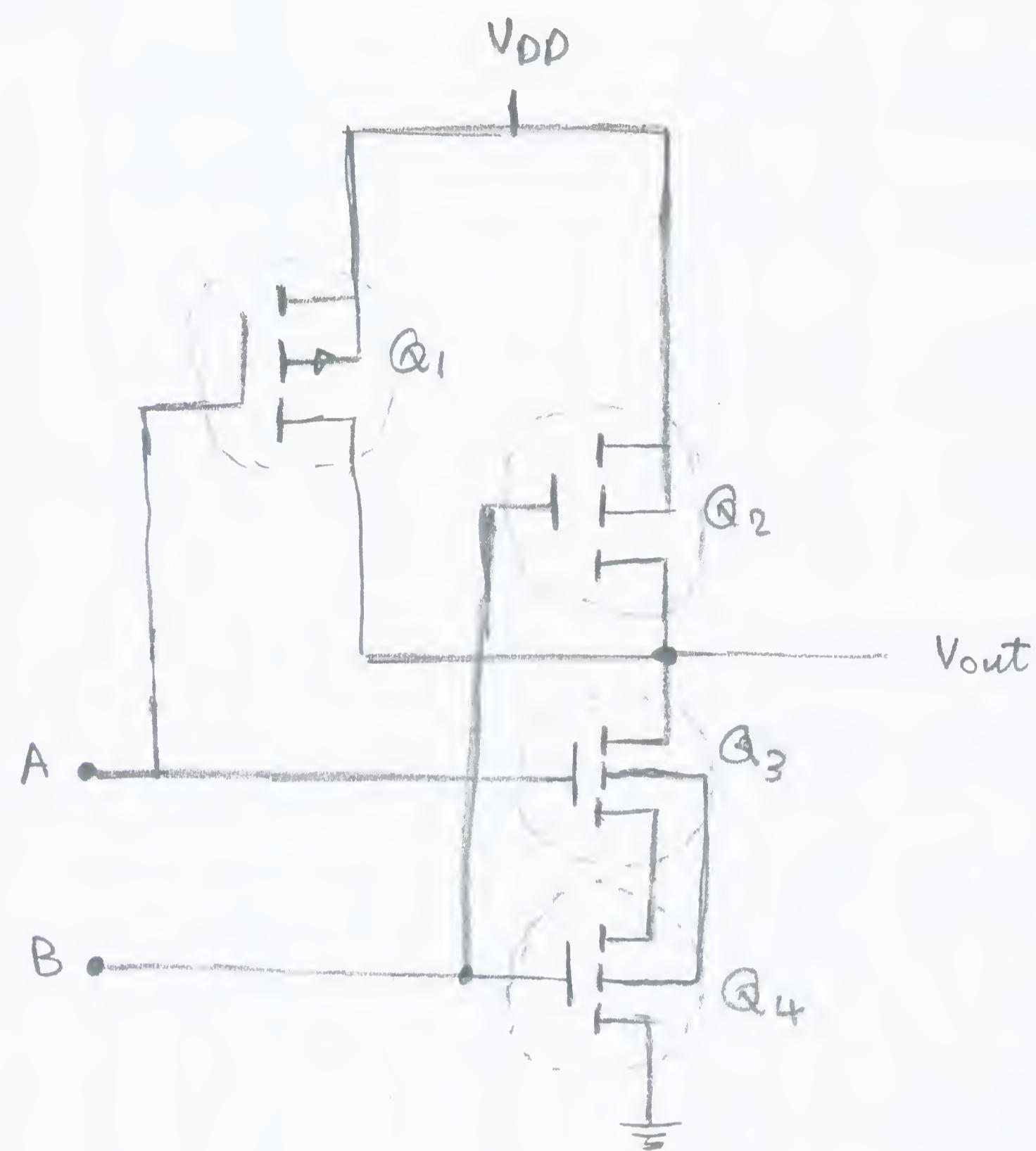
N- " " $\rightarrow off$

$V_{out} \rightarrow V_{DD}$



CMOS - NAND gate :

* operation Report



Voltage & Current rating :

$$I_{IH}(\text{max}) = 1 \text{ mA}$$

$$I_{IL}(\text{max}) = 1 \text{ mA}$$

$$I_{OH}(\text{max}) = 0.4 \text{ mA}$$

$$I_{OL}(\text{max}) = 0.4 \text{ mA}$$

* 4000 Series

* 74CXX Series

$$t_{D_{\text{CMOS}}} > t_{D_{\text{TTL}}} \quad , \quad P_{D_{\text{CMOS}}} < P_{D_{\text{TTL}}}$$

* 74LCXX

* 74-Bi-CMOS (TTL-CMOS) $t_P \rightarrow 2.9 \text{ nsec}$

* 74HCXX / 74HCTXX (High Speed / High Speed compatible with TTL)

* 74VHCXX / 74VHCTXX

* 74-Low voltage series (Power supply $\leq 3.3 \text{ V}$)

for notebook & mobile phones

- 74LVC (Low voltage CMOS)

- 74LVT (Low Voltage Technology)

74HLV (High Speed - Low voltage)

15V

Logic 1

3.5

undefined Region

1.5V

Logic 0